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SOCIOCULTURAL FACTORS RELATED TO PARENTS' AND CAREGIVERS'  
DECISIONS TO VACCINATE CHILDREN AGAINST HPV

BY

SAVANNAH MCSHEFFREY

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE

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OF

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## Abstract

Human Papillomavirus (HPV) is the most common sexually transmitted infection in the U.S and can lead to several types of cancers. A better understanding of the variables impacting HPV vaccination will help inform the development of effective disease prevention interventions. This study aims to describe factors that impact parents' and caregivers' decisions to vaccinate their children against HPV by examining sociocultural factors and behavioral change theory among parents or caretakers of sons and daughters (ages 9-18) from diverse socioeconomic, racial, and ethnic backgrounds. A national sample was recruited and participants completed demographic questions and measures related to their attitudes and beliefs about the vaccine and measures based on the transtheoretical model. These variables were used to predict child vaccine initiation and to validate existing measures using a novel sample. Health care provider recommendation, perceived vaccine effectiveness, pros for vaccination, and self-efficacy increased the likelihood that children had initiated the HPV vaccine. While no significant differences were found for race/ethnicity and gender on vaccine initiation, some disparities were noted. There were regional differences in perceived cons for vaccination, socioeconomic differences in self-efficacy and perceived effectiveness, and gender differences in health care provider recommendation and parent perception of cons, vaccine harm, and barriers. These findings may inform future, tailored interventions aimed at increasing HPV vaccine initiation among children and adolescents.

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## **Introduction**

Human papillomavirus (HPV) is the most common sexually transmitted infection (STI) and high-risk types can cause cancer (Baseman & Koutsky, 2005). Cervical cancer rates are higher in Black and Latina communities (National Cancer Institute, 2011; Ward et al., 2004). Disparities in uptake of the HPV vaccine will further perpetuate disparities in cancer rates. Health related behaviors are often influenced by sociocultural factors. A better understanding of the variables impacting HPV vaccination will help inform the development of effective disease prevention interventions. This study aims to describe differences in HPV vaccine uptake among parents or caretakers of sons and daughters (ages 9-18) from diverse socioeconomic, racial, and ethnic backgrounds. Racial/ethnic disparities, beliefs and perceptions about the vaccine, barriers to obtaining the vaccine, gender differences, health behavior change variables, and parent-child communication about vaccination and sexual health will be examined.

## **Human Papillomavirus and Vaccination**

HPVs are a group of viruses that infect the skin and mucous membranes. There are over 100 different types of HPV and more than 40 of these types are transmitted sexually. HPV is the most common STI in the U.S. (National Cancer Institute, 2013). The highest rates of HPV infection are found among sexually active individuals between the ages of 15-24 and in the U.S., over 14 million people contract a new HPV

infection every year (American Cancer Society, 2013). High-risk HPV types can cause cervical, vaginal, vulvar, anal, penile, and head/neck cancers. High-risk types are responsible for about 70% of cervical cancers (de Sanjose et al., 2010), almost all anal cancers, 40% of penile cancers, and 25-35% of oral cancers (Parkin & Bray, 2006; Watson et al., 2008). Low-risk HPV types cause cervical cell changes and cause 90% of genital warts (Gerend & Barley, 2009). The majority of HPV infections are asymptomatic and clear without medical intervention. However, around 10% of women who contract “high risk” HPV will develop persistent infections that can cause cervical cancer (Ault, 2006).

In 2006, the Food and Drug Administration approved Gardasil<sup>®</sup>, a vaccine that helps protect against the HPV types that are responsible for 70% of cervical cancer. It is recommended for males and females aged 9-26 years old (Centers for Disease Control and Prevention, 2006; Center for Disease Control and Prevention, 2011). Gardasil is a three dose vaccine series administered over six months. The Advisory Committee on Immunization Practices recommends universal vaccination of all 11-12 year old children as vaccination is preferable before sexual debut to optimize the protective benefits. However, “catch-up” vaccination of individuals aged 13-26 is also recommended (Dempsey, Gebremariam, Koutsky & Manhart, 2008).

A national survey found that only 28.9% of girls aged 11-17 years had received at least 1 dose of the vaccine and that only 14.2% had received all 3 doses (Laz, Rahman, & Berenson, 2012). Currently, less is known about vaccine uptake

among males. Using national samples, two studies found that in the first year after licensure, only 1-2% of adolescent boys had received at least 1 dose of the vaccine (Reiter, McRee, Kadis, & Brewer, 2011; Center for Disease Control and Prevention, 2011). Finding ways to increase vaccine uptake are very important. A recent study found a 56% decrease in vaccine type HPV prevalence among a nationally representative sample of females 14-19 years old in the vaccine era (2007-2010) when compared with the prevaccine era (2003-2006) (Markowitz et al., 2013).

### **Racial/Ethnic disparities**

In the U.S., cervical cancer incidence and mortality rates are higher in Black women than White women (National Cancer Institute, 2011). Rates of cervical cancer among African-American women remain 39% higher than among White women (American Cancer Society, 2011). In addition, cervical cancer mortality rates are more than twice as high among African-American women as among White women. Similarly, when compared with White women, age-adjusted cervical cancer incidence rates are 80% higher among Latinas (Ward et al., 2004). Universal HPV vaccination could potentially reduce racial and ethnic disparities in cancer prevalence and mortality. Unfortunately, those most at risk for vaccine-preventable disease are generally the least likely to obtain them, such as Latinos (Mays, Stru, & Zimet, 2004).

Awareness of HPV and HPV vaccination appear to be quite high. Jain and colleagues (2009) found that 84.3% of the women they surveyed (aged 18-49) had

heard of HPV and 78% of the women had heard of the HPV vaccine. However, awareness varied by racial/ethnic group, education level and insurance coverage. Black women and Hispanic women were less likely to be aware of the vaccine compared to non-Hispanic white women. Many disparities remain largely unexplained. Due to the age recommendation for vaccination, psychosocial variables among parents and care givers should be further examined.

### **Predictors of parents' acceptance and intention to vaccinate**

Several studies have examined predictors of HPV vaccine adoption. Wong and colleagues (2011) found that parental education of less than high school level, well-child check and influenza shot in the past year, and parental familiarity with the HPV vaccine were associated with higher vaccine uptake among girls ages 9-17 years. Another study describing HPV vaccination among adolescent girls in high-risk communities found that parent awareness of the vaccine, belief in vaccine effectiveness, and doctor recommendation were positively associated with vaccine initiation. They also found that negative attitudes toward the vaccine and needing more information about the vaccine were negatively associated with vaccine initiation (Guerry et al., 2011). Brewer and colleagues (2011) found that rates of vaccine initiation were higher among parents who perceived lower barriers to getting the vaccine, anticipated greater regret if their daughters got HPV and were not vaccinated, or were not born-again Christians.

Acceptance of the vaccine appears to be high in many communities. Bair, Mays, Sturm, and Zimet (2008) found that acceptance of the HPV was high in a sample of Latina mothers. They found that the reasons for not accepting the vaccine included a lack of information and feeling that their daughters were too young. Pierre Joseph and colleagues (2012) found that African-American mothers were more knowledgeable and accepting of the HPV vaccine than Haitian Immigrant mothers. Most African-American mothers felt that vaccination fell within the parental role, whereas most Haitian mothers felt uncomfortable vaccinating against STIs as they felt children should not be sexually active and reported discomfort discussing sex. Providers should focus on providing information about the rationale for vaccination in early adolescence and vaccine safety as they could potentially play a role in opening discussions about the protection that vaccination would provide, while remaining culturally sensitive.

Physician recommendation appears to be an extremely important predictor of vaccine uptake and may also play a role in vaccine disparity. Litton and colleagues (2011) did not find race, education, religion, knowledge, or perceived susceptibility to be significantly associated with intention to vaccinate their daughter in a sample of racially diverse caregivers from Alabama. However, they did find that the caregivers who were informed by their health care providers about the vaccine were more likely to vaccinate their adolescent daughters. Hamlish, Clarke, and Alexander (2012) examined motivators and barriers to HPV vaccination among African-American

mothers. They found that the mothers trusted physicians to initiate discussion of HPV vaccination and those physicians who failed to initiate the discussion generated doubt about the vaccine among the mothers. Ylitalo, Lee, and Mehta (2013) examined national data and found that when adolescents were provided with a health care provider recommendation for vaccination they were almost 5 times as more likely to receive the vaccine than those without a recommendation. This association between recommendation and vaccination appeared strong across all racial/ethnic groups; however, they found that racial/ethnic minorities were less likely to receive a recommendation. Further, Polonij and Carpiano (2013) found that the odds of receiving a recommendation were negatively associated with SES and black racial status.

### **Gender differences**

Mothers appear to show more willingness to vaccinate daughters. Linddon, Hood, Wynn, and Markowitz (2010) conducted a literature review and found that among mothers of sons, support of HPV vaccination varied widely from 12% to 100%. They also found that a preference to vaccinate females over males was reported in a majority of studies. This appeared to be due to the belief that the vaccine would not directly benefit males. A recent study found similar results, women with only a daughter were more willing than those with a son to vaccinate their child (71% vs 44%), mothers of both daughters and sons were more willing to vaccinate their daughters (67% vs 39%), and mothers of sons as compared to daughters were less

likely to consider their child at risk of HPV (27% vs 12%) (Berenson & Rahman, 2012).

Gilkey, Moss, McRee, and Brewer (2012) found that among sons, initiation of HPV vaccine was lower for those living in high income households and higher for those whose race was neither white nor black. Parents of unvaccinated sons were more likely than those of daughters to report not getting a physician's recommendation or not being aware that the vaccine was available for their son. Factors such as perceived benefit of HPV vaccine appear to differ by child's gender, it is important to continue filling in gaps in the literature by examining gender differences among parents in their intention to vaccinate their children against HPV.

Most studies examining adolescent HPV vaccine uptake surveyed mothers or female caregivers only. However, some studies surveyed male and female caregivers (Brewer, et al, 2011; Guerry et al., 2011; Gilkey et al., 2012). Among these studies, most respondents were female (between 88-91%). Attitudes and beliefs about HPV vaccination among both male and female caregivers should be further explored to identify potential differences across gender.

### **Parent Communication about sex and vaccination**

Parent-child communication about sex is associated with decreased sexual risk taking during adolescence and an older age at sexual debut (DeClemente et al., 2001; Miller et al., 1998). Parents should have conversations about sex early for them to be

most effective. Communication about sex should ideally begin before children begin having sex (Miller et al., 1998). However, parents often underestimate their child's level of sexual activity. Beckett and colleagues (2010) found that 40% of youth had intercourse before their parents talked with them about safe sex. Additionally, Latina and Asian mothers have been found to be less likely to discuss sex with their daughters when compared to Black and White mothers (Meneses, Orrell-Valente, Guendelman, Oman, & Irwin, 2006). Many parents rely on situations that arise spontaneously to prompt conversations with their children about safe sex. External cues, such as a child's sex education class can prompt parents to initiate conversations about sex (Rosenthal, Feldman, & Edwards, 1998; O'Sullivan, Meyer-Bahlburg, & Watkins, 2001).

Discussions about the vaccine may provide parents with an opportunity to talk with their children about STIs and safe sex. Communication about the HPV vaccine has been examined as a potential cue for mother-daughter communication about sex. McRee and colleagues (2012) found that 65% of mothers reported talking with their daughters about the HPV vaccine, of whom 41% reported that led to a conversation about sex. Mothers who talked with their daughters about HPV vaccination were more likely than those who had not to have also talked with them about sex (92% vs. 74%). Among the mothers who talked about sex when they talked about HPV vaccination, many felt that the vaccine provided a good reason to talk about sex (64%) or that it



made it easier to start the conversation (33%). To date, no study has examined the relationship between parent-son communication about sex and the HPV vaccine.

### **Transtheoretical Model**

The Transtheoretical Model (TTM) is an integrated and comprehensive model of behavioral change (Prochaska & Velicer, 1997). The TTM describes intentional behavior change through a series of five stages that result in long-term maintenance of the behavior: Precontemplation, Contemplation, Preparation, Action and Maintenance (Naar-King et al., 2006). These stages have been used to look at readiness to obtain the vaccine among college women. The TTM provides an integration of processes and principles of change from different theories, including Janis and Mann's (1977) model of decision making and Bandura's (1977) construct of self-efficacy (Schumann et al., 2005).

The TTM has been validated for many health-related behaviors including smoking, mammography screening and increasing condom use (Levy, 1997). When TTM constructs mentioned above are combined using validated measures, tailored interventions can be developed to target behavioral change. TTM measures of self-efficacy and decisional balance for HPV vaccination were validated among college women (Lipschitz et al., 2013). These measures were developed to examine a participants' confidence in their ability to complete the vaccine series and to measure a participants' pros and cons for receiving the vaccine. TTM-tailored interventions are a

promising option to increase vaccination. Before developing an intervention for caregivers, TTM measures should be validated within this unique population.

Brief interventions have been shown to be effective in increasing understanding of HPV and increasing positive attitudes towards vaccination in adult women (Doherty & Low, 2008). By gaining a better understanding of the variables that predict vaccine adoption among children and adolescents, interventions can be created and aimed at increasing vaccination at earlier ages. Interventions should be based on health behavior change theory in order to reach parents at different stages of change. Demographic variables should be considered to develop culturally competent interventions. Parent-child communication about sex and vaccination should be examined to develop better ways to promote safer sex.

The purpose of the current study is to examine differences in HPV vaccine uptake and parent-child communication about sex among parents/caregivers and their children. Predictors of HPV vaccination in a sample of diverse parents/caregivers will also be examined. The study extends previous research in several ways. Both parent and child demographics, parent attitudes and beliefs about the HPV vaccine, TTM variables, and parent-child communication about sex will be examined to determine whether they add unique variance in the prediction of vaccination. These variables will be used to predict the likelihood of falling into one of the two categories (vaccine initiated vs. vaccine uninitiated). The initiated group will be defined as having begun

the vaccine series (the series is contained within three shots: baseline, 2 months and 6 months). Specifically it is expected that:

Hypothesis 1: When parents/caregivers have received a health care provider's recommendation, their child will be more likely to have initiated the vaccine series.

Hypothesis 2: When parents perceive the vaccine as effective, their child will be more likely to have initiated the vaccine series, as measured by the CHIAS effectiveness subscale.

Hypothesis 3: When parents perceive the vaccine to be potentially harmful, their child will be less likely to have completed the vaccine series, as measured by the CHIAS harms subscale.

Hypothesis 4: When parents perceive barriers to vaccination, their child will be less likely to have initiated the vaccine series, as measured by the CHIAS barriers subscale.

Hypothesis 5: When parents feel uncertain about the vaccine, their child will be less likely to have initiated the vaccine, as measured by the CHIAS uncertainty subscale.

Hypothesis 6: Given the findings related to racial/ethnic differences in vaccine adoption rates, the percent initiating the vaccine series will differ by

racial/ethnic group. Racial and ethnic minorities will be less likely to have initiated the vaccine series.

Hypothesis 7: Given the findings related to gender differences in vaccine adoption rates, female children will be more likely to have initiated the vaccine series.

Hypothesis 8: Given the findings related to gender differences in vaccine uptake rates, among parents who haven't initiated the vaccine, those with sons will be less willing to initiate vaccination as they may perceive that their sons are less likely to benefit from the vaccine when compared to parents of daughters.

Hypothesis 9: Parents who talked to their child about HPV vaccination will be more likely than those who had not to have also talked with them about safe sex, as measured by the UNC Mother-Daughter Survey.

Hypothesis 10: In accordance with the TTM's decisional balance construct, the children of parents who have more pros and fewer cons for receiving the HPV vaccination will be more likely to have initiated the vaccine series, as measured by the Decision Balance for HPV scale.

Hypothesis 11: The children of those parents who have more vaccine self-efficacy (i.e., higher confidence) will be more likely to have initiated the vaccine series, as measured by the Self-efficacy for HPV scale.

Hypothesis 12: When all significant variables are looked at together, TTM variables (decisional balance, self-efficacy) will be the strongest predictors of HPV vaccine initiation.

Hypothesis 13: TTM measures of decisional balance and self-efficacy will be validated in a population of male and female parents/caregivers.

## **Method**

### **Participants**

Parents and caregivers were recruited using Survey Sampling International (SSI) and informal recruitment (i.e., emailing colleagues) using an online survey. A total of 335 participants began the online survey. However, 26 were removed from the data set because they indicated that they were not a parent or caregiver of a child between the ages of 9-18 during the initial screening question. Another 16 participants were removed from the data set as they quit before they completed the demographic questions. A total of 292 participants were included in the final data set.

### **Measures**

**Demographic questions.** The online questionnaire presented to participants included a series of demographic questions about the participants and their children including: gender, race/ethnicity (white, non-white), age, sexual orientation, country of origin, current state and region in which they reside (South, Northeast, Midwest, West), highest level of education (four years of college or more, some college, high school diploma/GED or less), household income (under \$25,000, \$25,000-\$50,000, \$50,000-\$75,000, \$75,000 or more, choose not to answer), and various questions about their child's vaccination status. Participants with more than one child between the ages of 9-18 were asked to think about their child that had the most recent birthday when answering the questions.

**Decisional Balance for HPV vaccination.** Developed by Lipschitz and colleagues (2011), the Decisional Balance scale is an 8-item questionnaire measuring the Pros and Cons of completing the vaccine series. Four items represent the Pros of receiving the vaccine series and four items represent the Cons of receiving the vaccine series. An example of a Pros item is “Protecting my child from HPV would make me feel good”. An example of a Cons item is “Receiving the series of three shots would take too much time”. The items are measured using a 5-point Likert scale ranging from 1 = ‘Not Important’ to 5 = ‘Extremely Important’. Responses are summed for the Pros items and the Cons items separately, producing two continuous predictor variables. Higher scores represent higher perceptions for the pros and cons variables. According to the authors, internal consistency is good for the Pros scale ( $\alpha=0.90$ ) and adequate for the Cons scale ( $\alpha=0.66$ ). In the current study, the Cronbach alpha coefficient was good for the Pros scale ( $\alpha=0.86$ ) and the Cons scale ( $\alpha=.88$ ).

**Self-Efficacy for HPV vaccination.** Developed by Lipschitz and colleagues (2011), the Self-Efficacy scale is a 6-item questionnaire aimed at measuring participants’ confidence in their ability to complete the vaccine series in situations that may prove challenging. An example of an item is “When I think about the possible side effects of the vaccine”. Items are measured on a 5-point Likert scale, ranging from 1=“Not at All Confident” to 5=“Extremely Confident.” All items are summed producing a continuous predictor variable. Higher scores represent higher perceptions

for self-efficacy. According to the authors, internal consistency is good ( $\alpha=0.84$ ). In the current study, the Cronbach alpha coefficient was good ( $\alpha=.89$ ).

**The Carolina HPV Immunization Attitudes and Beliefs Scale (CHIAS).**

Developed by McRee and colleagues (2010), the CHIAS is a 16-item questionnaire aimed at measuring a range of parent attitudes and beliefs about HPV vaccine. The authors identified four CHIAS subscales, all of which had acceptable scale alphas and one-year test-retest reliability. An example of an item from the Perceived Harms subscale is “The HPV vaccine might cause short term problems, like fever or discomfort”. The items are measured using a 4-point Likert scale ranging from 1= ‘Strongly Disagree’ to 4= ‘Strongly Agree’. Responses are reverse scored and summed for each subscale, producing four continuous predictor variables. Higher scores represent higher perceptions of Perceived Harm, Barriers, Effectiveness, and Uncertainty. According to the authors, the subscales include Perceived Potential Harms of HPV vaccination ( $\alpha=.69$ ), Perceived Barriers to vaccination ( $\alpha=.69$ ), Perceived Effectiveness of HPV vaccination ( $\alpha=.61$ ), and Uncertainty about HPV vaccination ( $\alpha=.66$ ). In the current study, the Cronbach alpha coefficient was good for Perceived Potential Harms ( $\alpha=.84$ ), Perceived Barriers ( $\alpha=.92$ ), Perceived Effectiveness ( $\alpha=.83$ ), and adequate for Uncertainty ( $\alpha=.45$ ).

**UNC Mother-Daughter Communication Survey.** Developed by McRee and colleagues (2009), the mother-daughter communication survey is based on established measures in the literature (Miller et al., 2009) as well as HPV vaccine research



involving parents of adolescent girls (Reiter, et al., 2009; McRee et al., 2011). The survey assesses mother-daughter communication about sex, mother-daughter communication about HPV vaccination, and other potential cues to talking about sex. Questions were reworded to include sons and fathers. An example of an item is “I think that my child should wait until he/she is married to have sex”. Some items are measured using a 5-point Likert scale, ranging from 1=’Strongly Disagree’ to 5=’Strongly Agree’. Other items are measured with a ‘Yes’ or ‘No’. Individual items were used to examine parent-child communication about HPV vaccination and safe sex.

## **Procedure**

Parents and caregivers were recruited using SSI and informal recruitment using an online survey. SSI is a global provider of sampling solutions for survey research and data collection and provided recruitment of national data. National data was census balanced for race/ethnicity and geographical region. Only parents and caregivers of children or adolescents between the ages of 9-18 were eligible for this study as Gardasil® is only recommended for children starting at age 9. Participants recruited through SSI earned points for completing the survey which could be exchanged for small prizes. Informally recruited participants were not offered any incentive for completing the survey. Following Institutional Review Board approval, participants completed the survey via SurveyMonkey.com. The participants were first given Informed Consent to Participate in Research and brief instructions. All

responses were kept anonymous to protect participant's privacy. Following that, the survey began and participants were asked to try to complete all of the included questions.

### **Data Analysis**

Descriptive statistics were run to examine outliers, means, standard deviations, skewness, kurtosis, frequencies, and correlations among variables. A series of independent-samples t-tests, one-way ANOVAs, and chi-squares were run to explore demographic group differences across TTM and CHIAS variables. Logistic regression analysis was conducted to examine the likelihood of falling into one of the two outcome categories (initiated vaccine vs. did not initiate vaccine) given the categorical and continuous predictor variables described in hypotheses 1-12. A confirmatory factor analysis (CFA) was used to validate the use of the TTM measures within this sample of parents and caregivers. Missing data as well as preliminary assumption testing were assessed. All analyses were performed using IBM SPSS v. 22 and EQS.

## **Results**

### **Description of the Sample**

The final sample was composed of 292 parents and caregivers between the ages of 27 and 64 ( $M=40.67$ ,  $SD=7.94$ ). The participants identified as White (69.9%), Latino/Latina (11.6%), Black/African American (11%), Asian (4.8%), American Indian (1.4%), Native Hawaiian or Pacific Islander (.3%), and Other (1%). The modal participant identified as a mother (63%), heterosexual (93.5%), married (77.4%), had a 4-year degree or higher (52%), had an estimated household income of 75,000 or higher (45.9%), were born in the United States (89.7%), were currently living in the northeast (35.3%), and had two children (38%). The children were between nine and 18 years old ( $M =12.38$ ,  $SD =3.08$ ). The modal child described by participants was female (54.1%), White (66.4%), had not completed the HPV vaccine series (64.7%), and had not started the vaccine series (50.3%). Complete demographic information for the sample are presented in Table 1.

### **Exploratory Analyses**

Descriptive statistics for the TTM and CHIAS measures are shown in Table 2. Exploratory analyses were run to examine demographic group differences in vaccination, TTM variables, and attitudes and beliefs about HPV vaccination (see Tables 3 and 4).

**Demographics differences on TTM, CHIAS, vaccine completion, vaccine initiation, and health care provider recommendation.**

**Parent Race.** There were no significant differences in scores for race/ethnicity on the TTM variable scores (pros, cons, self-efficacy) or CHIAS (perceived harm, barriers, effectiveness, uncertainty) scores. Additionally, there was no significant association between race/ethnicity and vaccine completion, initiation, or health care provider recommendation.

**Child Gender.** There was a significant difference in cons for vaccination series between male children ( $M=52.47$ ,  $SD=10.73$ ) and female children ( $M=47.85$ ,  $SD=8.83$ );  $t(289) = -4.039$ ,  $p = .000$ , two-tailed. There was a significant difference in CHIAS perceived harm for vaccination scores between male children ( $M=51.24$ ,  $SD=10.31$ ) and female children ( $M=48.85$ ,  $SD=9.58$ );  $t(288) = -2.044$ ,  $p = .042$ , two-tailed. There was a significant difference on CHIAS barriers for vaccination scores between male children ( $M=52.50$ ,  $SD=10.89$ ) and female children ( $M=47.89$ ,  $SD=8.69$ );  $t(288) = -3.94$ ,  $p = .000$ , two-tailed. There were no significant differences in scores for child gender on the pros, self-efficacy, effectiveness, or uncertainty scores. A Chi-square test for independence (with Yates Continuity Correction) indicated that there was a significant association between child gender and health care provider recommendation,  $\chi^2(1, n = 273) = 6.43$ ,  $p = .011$ ,  $phi = -.161$ . There was no significant association between child gender and vaccine completion or initiation.

**Parent Gender.** There was a significant difference in uncertainty for vaccination scores between male parents ( $M=52.51$ ,  $SD=10.10$ ) and female parents ( $M=48.82$ ,  $SD=9.75$ );  $t(289) = -2.76$ ,  $p = .003$ , two-tailed. There were no significant differences in scores for parent gender on TTM variables or perceived harm, barriers, or effectiveness for vaccination scores. A Chi-square test for independence (with Yates Continuity Correction) indicated that there was a significant association between parent gender and vaccine initiation,  $\chi^2(1, n = 292) = 4.37$ ,  $p = .037$ ,  $phi = .130$  and parent gender and vaccine completion,  $\chi^2(1, n = 292) = 4.092$ ,  $p = .043$ ,  $phi = .126$ . There was no significant association between parent gender and health care provider recommendation.

**Parent Education.** ANOVA revealed mean scores on the self-efficacy measure differed significantly by parent's level of education,  $F(2, 289) = 4.202$ ,  $p = .016$ . No significant group differences were found between parent education and pros, cons, or CHIAS variables. There was no significant association between parent education and vaccine completion, initiation, or health care provider recommendation.

**Geographical Region.** The ANOVA showed mean scores on the cons measure differed significantly by region,  $F(3, 288) = 2.886$ ,  $p = .036$ . No significant group differences were found between region and pros, self-efficacy, or CHIAS variables. There was no association between region and vaccine completion, initiation, or health care provider recommendation.

**Household income.** The ANOVA showed mean scores on the perceived effectiveness measure differed significantly by household income,  $F(4, 279)=3.12$ ,  $p=.016$ . Mean scores on the uncertainty measure also differed significantly by household income,  $F(4, 279)=3.52$ ,  $p=.008$ . No significant differences were found between household income on TTM variables or perceived harm or barriers.

### **Hypothesis Testing**

**Hypothesis 1: When parents/caregivers have received a health care provider's recommendation, their child will be more likely to have initiated the vaccine series.** A logistic regression analysis was performed to assess the relationship between health care provider recommendation and child vaccine initiation (received at least one shot in the series). The model contained health care provider recommendation as the independent variable (0=no health care provider recommendation; 1=health care provider recommendation). The 'odds ratio' for recommendation was 11.73 with a 95% confidence interval of [6.63-20.75],  $p < .000$ . This suggests that those who were recommended by their health care provider are almost 12 times more likely to initiate the vaccine compared to those who did not receive the recommendation (see Table 5).

**Hypothesis 2: When parents perceive the vaccine as effective (as measured by the CHIAS effectiveness subscale), their child will be more likely to have initiated the vaccine series.** A logistic regression analysis was performed to assess

the relationship between parent's perception of vaccine effectiveness and child vaccine initiation. The model contained vaccine effectiveness as the continuous independent variable. The 'odds ratio' for perceived effectiveness was 1.08 with a 95% confidence interval of [1.05-1.11],  $p < .000$ . This suggests that for each one unit increase in perceived vaccine effectiveness, the children were 8% more likely to have initiated the vaccine series (see Table 5). The range for this scale was 2-8, so participants with a score of 3 are 8% more likely to have initiated the vaccine compared to participants with a score of 2.

**Hypothesis 3: When parents perceive the vaccine to be potentially harmful (as measured by the CHIAS perceived harm subscale), their child will be less likely to have completed the vaccine series.** A logistic regression analysis was performed to assess the relationship between parent's perception of potential harm caused by the vaccine and child vaccine initiation. The model contained potential harm as the continuous independent variable. The 'odds ratio' for perceived harm was .96 with a 95% confidence interval of [.936-.982],  $p < .001$ . This suggests that for each one unit increase in perceived harm, the children were 4% less likely to have initiated the vaccine series (see Table 5). The range for this scale was 6-24, so participants with a score of 7 are 4% less likely to have initiated the vaccine compared to participants with a score of 6.

**Hypothesis 4: When parents perceive barriers to vaccination (as measured by the CHIAS perceived barriers subscale), their child will be less**

**likely to have initiated the vaccine series.** A logistic regression analysis was performed to assess the relationship between parent's perception of barriers to vaccination and child vaccine initiation. The model contained perceived vaccine barriers as the continuous independent variable. The 'odds ratio' for perceived barriers was 1.04 with a 95% confidence interval of [1.02-1.06],  $p < .003$ . This suggests that for each one unit increase in perceived vaccine barriers, the children were 4% more likely to have initiated the vaccine series (see Table 5). The range for this scale was 5-20, so participants with a score of 6 are 4% more likely to have initiated the vaccine compared to participants with a score of 5.

**Hypothesis 5: When parents feel uncertain about the vaccine (as measured by the CHIAS uncertainty subscale), their child will be less likely to have initiated the vaccine.** A logistic regression analysis was performed to assess the relationship between parent's feelings of uncertainty about the vaccine and child vaccine initiation. The model contained uncertainty as the continuous independent variable. The 'odds ratio' for uncertainty was .97 with a 95% confidence interval of [.95-1.00],  $p = .076$ , and was not statistically significant. This suggests that the model was not able to distinguish between respondents who reported and did not report vaccine initiation (see Table 5).

**Hypothesis 6: Given the findings related to racial/ethnic differences in vaccine adoption rates, the percent initiating the vaccine series will differ by racial/ethnic group. Racial and ethnic minorities will be less likely to have**



**initiated the vaccine series.** Logistic regression analysis was performed to assess the relationship between race and ethnicity and child vaccine initiation. The model contained race (0=white; 1=non-white) as the independent variable. The ‘odds ratio’ for race was 1.24 with a 95% confidence interval of [.75-2.05],  $p=.40$ , and was not statistically significant. The second model contained ethnicity (0=non-Latino; 1=Latino) as the independent variable. The ‘odds ratio’ for ethnicity was 1.16 with a 95% confidence interval of [.57-2.37],  $p=.684$ , and was not statistically significant. These results suggest that the model was not able to distinguish between respondents who reported and did not report vaccine initiation (See Table 5).

**Hypothesis 7: Given the findings related to gender differences in vaccine adoption rates, male children will be less likely to have initiated the vaccine series.** A logistic regression analysis was performed to assess the relationship between child’s gender and child vaccine initiation. The model contained child gender (0=female; 1=male) as the independent variable. The ‘odds ratio’ for gender was 1.37 with a 95% confidence interval of [.87-2.18],  $p=.178$ , and was not statistically significant. This suggests that the model was not able to distinguish between respondents who reported and did not report vaccine initiation (See Table 5).

**Hypothesis 8: Given the findings related to gender differences in vaccine uptake rates, among parents who haven’t initiated the vaccine, those with sons will be less willing to initiate vaccination as they may perceive that their sons are less likely to benefit from the vaccine when compared to parents of daughters. A**

logistic regression was performed to assess the relationship between child gender and stage of change. The model contained child gender (0=male; 1=female) as the independent variable and Stage of Change (0=Precontemplation and Contemplation collapsed; 1=Preparation) as the dependent variable. The ‘odds ratio’ for gender was 1.2 with a 95% confidence interval of [.60-2.4],  $p=.577$ , and was not statistically significant. This suggests that the model was not able to distinguish between respondents who were in Precontemplation/Contemplation and Preparation (See Table 5).

**Hypothesis 9: Parents who talked to their child about HPV vaccination will be more likely than those who had not to have also talked with them about safe sex, as measured by the UNC Mother-Daughter Survey.** A logistic regression analysis was performed to assess the relationship between parents talking to their child about the HPV vaccine and parents also talking to their child about safe sex topics. The model contained HPV discussion (0=did not talk to child about HPV; 1=did talk to child about HPV) as the independent variable. The ‘odds ratio’ for discussing HPV vaccination was 2.90 with a confidence interval of [1.90-4.42],  $p<.000$ . This suggests that those who discussed HPV vaccination with their child were almost three times more likely to have also discussed safe sex (see Table 5).

**Hypothesis 10: In accordance with the TTM’s decisional balance construct, the children of parents who have more pros and fewer cons for receiving the HPV vaccination will be more likely to have initiated the vaccine**

**series, as measured by the Decision Balance for HPV scale.** A logistic regression analysis was performed to assess the relationship between pros and cons for receiving the HPV vaccine and child vaccine initiation. Two logistic regressions were run. The first used pros and the second used cons as the continuous independent variable. The ‘odds ratio’ for pros was 1.06 with a 95% confidence interval of [1.05-1.10],  $p < .000$ . This suggests that for each one unit increase in pros, the child was 6% more likely to have initiated the vaccine. The range for this scale was 4-20, so participants with a score of 5 are 6% more likely to have initiated the vaccine compared to participants with a score of 4.

The ‘odds ratio’ for cons was 1.05 with a 95% confidence interval of [1.02-1.07],  $p < .000$ . This suggests that for each one unit increase in cons, the child was 5% more likely to have initiated the vaccine (See Table 5). The range for this scale was 4-20, so participants with a score of 5 are 5% more likely to have initiated the vaccine compared to participants with a score of 4.

**Hypothesis 11: The children of those parents who have more vaccine self-efficacy (i.e., higher confidence) will be more likely to have initiated the vaccine series, as measured by the Self-efficacy for HPV scale.** A logistic regression analysis was performed to assess the relationship between self-efficacy and child vaccine initiation. The model contained self-efficacy as the continuous independent

variable. The ‘odds ratio’ was 1.07 with a 95% confidence interval of [1.04-1.10],  $p < .000$ . This suggests that for each one unit increase in self efficacy, the child was 7% more likely to have initiated the vaccine (See Table 5). The range for this scale was 6-30, so participants with a score of 7 are 7% more likely to have initiated the vaccine compared to participants with a score of 6.

**Hypothesis 12: When all significant variables are looked at together, TTM variables (decisional balance, self-efficacy) will be the strongest predictors of HPV vaccine initiation.** A multivariate logistic regression analysis was performed to assess of the relationship between the variables that were found to be significant in the univariate logistic regressions and child vaccine initiation. The model contained seven independent variables (healthcare provider recommendation, perceived vaccine effectiveness, perceived harm, barriers to vaccination, pros, cons, and self-efficacy). As shown in Table 8, three of the independent variables made a unique statistically significant contribution to the model (healthcare provider recommendation, barriers to vaccination, and perceived harm to vaccination). The strongest predictor of reporting vaccine initiation was healthcare provider recommendation, recording an odds ratio of 18.84 and a 95% confidence interval of [8.96-39.63],  $p < .000$ . This indicates that respondents who received a healthcare provider recommendation were over 18 times more likely to have initiated the vaccine series, controlling for all other factors in the model. See Table 6.

**Hypothesis 13: TTM measures of decisional balance and self-efficacy will be validated in a population of male and female parents/caregivers.** The eight items of the Decisional Balance for HPV vaccination scale were subjected to confirmatory factor analysis (CFA) using structural equation modeling in EQS software (see Figure 1). Four models were tested: (1) null model (suggesting no latent factors and used as a comparative model), (2) one factor, (3) two uncorrelated Pros and Cons factors, and (4) two correlated Pros and Cons factors. The two-factor correlated model demonstrated the best fit,  $\chi^2 (19)=66.65$ ,  $p<.05$ , CFI= .964, GFI=.948, RMSEA=.093, and AASR= .045. The correlation between the Pros and Cons scales was .051.

The six items of the Self-efficacy for HPV vaccination scale were subjected to CFA (see Figure 2). Two models were tested: the null model and a one-factor model. The one-factor model demonstrated the best fit,  $\chi^2 (9)=29.26$ ,  $p<.05$ , CFI= .977, GFI=.968, RMSEA=.088, and AASR= .020.

## **Discussion**

The current study examined sociocultural predictors of parents' and caregivers' decisions to vaccinate their children against HPV. The study extends previous research by examining a diverse national sample of parents and caregivers. The data was census balanced for race/ethnicity and region of origin and male and female respondents were surveyed about their beliefs about the HPV vaccine as it relates to both male and female children. It is also one of few studies to compare male and female parents' attitudes about HPV vaccination. Most previous studies examining parents' attitudes and beliefs surveyed mothers or female caregivers only. Some attempted to survey both male and female caregivers (Brewer, et al, 2011; Guerry et al., 2011; Gilkey et al., 2012) but found that most respondents were female (between 88-91%). The current study found that 31.8% of the respondents were male, allowing for a deeper understanding of male caregivers' attitudes and the role they play in deciding to vaccinate their children. Additionally, this is one of few studies to compare male and female children and contributes to an emerging body of literature reporting rates of HPV vaccine initiation among young males. Almost 46% of the children described in the study were male. Finally, this is the first study to examine TTM variables related to HPV vaccination among parents and caregivers of children and adolescents that are eligible for the HPV vaccine.

The modal participant identified as a white, heterosexual mother and was married, had a 4-year degree or higher, had an estimated household income of 75,000

or higher, was born in the United States, currently living in the northeast, and had two children. The modal child described by respondents was female, white, and had not completed the HPV vaccine series. Surprisingly, more male children initiated the vaccine than female children (54% vs. 46%) though Centers for Disease Control and Prevention reported that nationally 53% of female adolescents had received at least one shot and only 21% of male adolescents had received on shot (Centers for Disease Control and Prevention, 2013).

### **Sociocultural Predictors**

**Health care provider recommendation.** Consistent with past research indicating that health care provider recommendation is a strong predictor of HPV vaccination (Gilkey, Moss, McRee, & Brewer, 2012; Reiter, Brewer, & Smith, 2010; Reiter, Brewer, McRee et al., 2010; Ylitalo, Lee, Mehta, 2012), health care provider recommendation was found to be the strongest predictor of vaccine initiation and respondents who reported that their child received a health care provider recommendation were 18 times more likely to have initiated. This finding is especially important as researchers have found that providers are less likely to recommend the vaccine to boys and racial/ethnic minorities which may contribute to the lower vaccination rates found among these groups (Gilkey, Moss, McRee, & Brewer, 2012; Ylitalo, Lee, Mehta, 2012). These findings highlight the need for more effective methods to promote vaccination recommendation among health care providers to

ensure that all demographic groups are receiving the same recommendations and information.

**Race/ethnicity and Socioeconomic Status.** Contrary to previous findings (Mays, Stru, & Zimet, 2004; Jain et al., 2009), race and ethnicity did not predict vaccine initiation or completion and there were no significant differences found across race/ethnicity on TTM or CHIAS variables, vaccine initiation or completion, or health care provider recommendation. In fact, more racial and ethnic minorities had initiated the vaccine than white respondents (53.4% vs. 48%) and more than half of non-white respondents' children had initiated the vaccine.

Perhaps some of the disparities found in previous studies can be better explained by socioeconomic factors. The current study found that parents with 4-years of college education or higher reported significantly higher self-efficacy for vaccinating their child against HPV as compared to parents with less education. In addition, parents living in households with an annual income of \$75,000 or more reported significantly higher scores for perceived vaccine effectiveness.

Regional differences in vaccine uptake have previously been found. HPV vaccine coverage was highest in the Northeast and lowest in the South (Centers for Disease Control and Prevention, 2013). Related to these previous findings, current respondents living in the West reported significantly more cons for vaccinating their child followed by the South, Midwest, and Northeast. This is particularly troublesome



given the increased cervical cancer disparities among women living in low-income regions with limited healthcare access like the Appalachian South (Katz et al., 2009). Three primary barriers have been identified for Appalachian women, misinformation about HPV and the HPV vaccine, tangible barriers, and ambiguous information sources (Mills, Head, Vanderpool, 2013). In addition, many communities are experiencing growing numbers of parents who are delaying and/or refusing available recommended vaccinations for their children (Larson, Jarrett, Eckersberger, Smith, & Paterson, 2014; Dube, Vivion, & MacDonald, 2015; Dube, Gagnon, Nickels, Jeram, Schuster, 2014) which may explain why respondents in the West reported more cons for vaccination.

Taken together, these findings indicate that parents from higher socioeconomic households feel more confident that they will vaccinate their child for HPV and perceive the vaccine to be more effective. Conversely, some parents may be a part of the “anti-vaccine movement” and see many more cons to vaccination than others and the reasons for this are often complex and context-specific (Larson, Jarrett, Eckersberger, Smith, & Paterson, 2014). Health care providers should use clear and purposeful communication about the development of HPV related cancers and the purpose and safety of the vaccine. Additionally, marketing and social marketing practices may be used to foster vaccine acceptance (Nowak, Gellin, MacDonald, & Butler, 2015).

**Gender.** Based on previous findings (Linddon, Hood, Wynn, and Markowitz, 2010; Centers for Disease Control, 2013), it was hypothesized that male children would be less likely to have initiated the vaccine, however, gender did not predict vaccine initiation or completion. While gender was not predictive of vaccine uptake, exploratory analyses found differences that were similar to previous findings (Berenson & Rahman, 2012; Gilkey, Moss, McRee, & Brewer, 2012). There were significant differences between parent's attitudes and beliefs about vaccinating male vs. female children. Parents and caregivers indicated that they had more cons, perceived more harm, and perceived more barriers for vaccinating male children as compared to female children. Female children also appeared to receive a larger percent of health care provider recommendations to vaccinate as compared to male children (56% vs. 43.6%). Despite these differences, 54% of male children in the study had initiated the vaccine and 38% had completed the vaccine series. This may partially be explained by the slight increase in HPV vaccine uptake among males in recent years (Pierre-Victor, Mukherjee, Bahelah, & Madhivanan, 2014) and the implementation of the Patient Protection and Affordable Care Act of 2010 (Centers for Disease Prevention and Control, 2013).

Additionally, there were significant differences found between parents' gender and vaccine initiation/completion. While male parents reported more uncertainty about vaccinating their children, they reported that more of their children had initiated the vaccine and completed the vaccine as compared to female respondents (59% vs. 45%;

44% vs. 31%). It is difficult to hypothesize about this finding given the dearth of research in this area. Most studies examining parents' decisions to vaccinate their children include very little information about male parents' perspectives (May, Sturm, & Zimet, 2004; Downs, de Bruin, & Fishhoff, 2008; Trim, Nagji, Elit, & Roy, 2011).

**Parent-child Communication.** Parents who talked to their children about HPV vaccination were almost three times more likely to have also talked to them about safe sex practices. Many parents rely on situations that arise spontaneously to prompt conversations with their children about safe sex (Rosenthal, Feldman, & Edwards, 1998; O'Sullivan, Meyer-Bahlburg, & Watkins, 2001). These findings suggest that discussions about the vaccine may provide parents with an opportunity to talk with their children about STIs and the importance of safe sex. Perhaps health care providers could use HPV vaccine recommendation as a cue to talk to parents about using the vaccine to prompt a conversation about safe sex as parent-child communication about sex is associated with decreased sexual risk taking during adolescence and an older age at sexual debut (DeClemente et al., 2001; Miller et al., 1998).

### **CHIAS Predictors**

As hypothesized, perceived effectiveness and perceived harm predicted vaccine initiation. The results indicated that as the respondents' perceived effectiveness increased, the likelihood that their child had initiated the vaccine

increased. As the respondents' perceived harm increased, the likelihood that their child had initiated the vaccine decreased. Interestingly, as respondents' perceived barriers increased, the likelihood that their child had initiated the vaccine increased. Respondents' mean score on effectiveness was higher than their mean score on barriers. Perhaps these parents' high level of perceived vaccine effectiveness helped them to overcome the perceived barriers. Additionally, most questions on the barriers subscale addressed vaccine affordability and availability. Implementation of the Patient Protection and Affordable Care Act of 2010 now requires private health care plans to offer, at no cost to beneficiaries, vaccines recommended by ACIP (Centers for Disease Prevention and Control, 2013), these changes could have helped respondents to overcome some barriers and initiate vaccination.

Previously, health care providers reported that parental beliefs, perceptions, and misconceptions about the vaccine acted as barriers to HPV vaccination in a clinic serving a predominantly Hispanic population (Javanbakht et al., 2012). Taken together, these findings highlight the importance of providing parents with accurate information about vaccine harm and effectiveness. Vaccine misconceptions could be addressed with education about the need for child and adolescent vaccines, the safety of the vaccine, and availability of the vaccine.

## **TTM Predictors**

As hypothesized, the TTM variables (decisional balance and self-efficacy) were predictors of vaccine initiation. The results indicated that as the number of pros increased, the likelihood of vaccine initiation increased. As respondents reported greater self-efficacy for vaccination, the likelihood of vaccine initiation increased. Surprisingly, as the number of cons increased, the likelihood of vaccine initiation also increased. Respondents indicated a large number of both pros and cons, but overall they reported more pros. Literature on other health behaviors supports the importance of pros on health behavior decision making. Part of the decision to move towards action/maintenance (initiation of the vaccine and ultimately completion of all three shots) is based on the relative weight given to the pros and cons of making a behavioral change. Pros may be thought of as facilitators of change (Prochaska, et al., 1994) which would explain why respondents weighing more pros for vaccination would be more likely to have made a behavioral change (initiating the vaccine). Alternatively, it is possible that the cross-sectional design of the study limited our assessment of the relationship between pros and vaccine completion. Many of the respondents reported that their child had already started the vaccine series. Vaccine initiation could be impacting the parent's rating of their pros and cons for vaccination.

As hypothesized, the TTM measures for decisional balance and self-efficacy for HPV vaccination were validated in a sample of parents and caregivers. This adds three new TTM-based measures to the literature. These measures can be used to

understand behavior change among parents of children that are eligible to receive the HPV vaccine and will promote vaccination research.

### **Limitations**

There are several limitations to this study that should be considered. Parents and caregivers reported their child's vaccination status, leaving room for errors in reporting. It is possible that their child's other parent or guardian is responsible for taking them to see their health care provider and that they might have more accurate information about their child's vaccination status. The results are based on a convenience sample as 71.2% of the respondents used SSI to complete the survey and 28.8% were recruited informally (via emailing the survey to colleagues). Participants recruited through SSI earn points for completing surveys and exchange them for small prizes. Although the sample was reflective of the racial/ethnic and regional breakdown of the United States, participants that are willing and able to commit time to completing online surveys may have unique characteristics. For example, the sample was not diverse in terms of socioeconomic status as almost half of the respondents reported an annual household income of \$75,000 or greater and over half had earned a 4-year degree or higher. Given this homogeneity, the relationship between socioeconomic status and vaccine initiation was unable to be fully explored. Future research will be required to determine generalizability.

## **Future Directions**

Notwithstanding these warnings, this study provides a number of meaningful conclusions that will help further investigation of HPV vaccine behaviors among children and adolescents. Low adherence to vaccine recommendation is an issue of major public health concern. To our knowledge, this is the first study to validate TTM measures for HPV vaccination with a sample of parents and caregivers. It is also the first study to examine sociocultural characteristics and TTM variables as they relate to both male and female parents' decisions to vaccinate their children against HPV. Given that pros, self-efficacy, and perceived effectiveness were found to be predictive of vaccine initiation, these variable appear to make a difference in whether a parent chooses to vaccinate their child. However, the respondents' pros, self-efficacy, and perceived effectiveness may have increased following vaccine initiation. A longitudinal design would be helpful in determining whether these variables predict vaccine initiation or if vaccine initiation predict an increase in those variables.

These findings may inform future TTM-tailored interventions aimed at increasing HPV vaccine initiation among children and adolescents. Further, population-based approaches to increasing HPV vaccination may be possible and are likely to have the most impact on reducing rates of HPV related cancers. Previous research has illustrated the utility of tailored approaches to interventions that can be provided on a population basis (Krebs, Prochaska, & Rossi, 2010). Future studies should also assist in developing tailored approaches to interventions for both health

care providers and parents and caregivers. Future work should examine ways to ensure that health care providers are providing equivalent information about vaccination to all patients regardless of race/ethnicity, gender, and socioeconomic status. Additionally, researchers should examine ways to increase parents' pros, self-efficacy, and perceived effectiveness for HPV vaccination for sons as well as daughters.

## **Conclusions**

The current study examined sociocultural predictors of parents' and caregivers' decisions to vaccinate their children against HPV. Health care provider recommendation, perceived vaccine effectiveness, pros for vaccination, and self-efficacy increased the likelihood that children had initiated the HPV vaccine. While no significant differences were found for race/ethnicity and gender on vaccine initiation, some disparities were noted. There were regional differences in perceived cons for vaccination, socioeconomic differences in self-efficacy and perceived effectiveness, and gender differences in health care provider recommendation and parent perception of cons, vaccine harm, and barriers. These findings may inform future, tailored interventions aimed at increasing HPV vaccine initiation among children and adolescents.



Table 1. Demographics

Parent Demographics			
		%	N
<b>Parent Race/Ethnicity</b>			
	White	69.9	204
	Latino/Latina	11.6	34
	Black/African American	11	32
	Asian	4.8	14
	American Indian	1.4	4
	Native Hawaiian or Pacific Islander	0.3	1
	Other	1	3
<b>Parent Status</b>			
	Mother	63	184
	Father	28.4	83
	Female Guardian or Caregiver	5.1	15
	Male Guardian or Caregiver	3.4	10
<b>Parent Sexual Orientation</b>			
	Heterosexual	93.5	273
	Lesbian or Gay	1.4	4
	Bisexual	3.8	11
	Pansexual	0.3	1
	Prefer not to Answer	1	3
<b>Marital Status</b>			
	Married	77.4	226
	In a Relationship and Living with Partner	6.2	18
	In a Relationship and not Living with Partner	0.7	2
	Single, Never Married	7.9	23
	Divorced	4.8	14
	Separated	1	3
	Widowed	1.4	4
	Domestic Partnership	0.7	2
<b>Parent Education</b>			
	Four Years of Higher	52.7	154
	Some College	35.6	104
	HS Diploma/GED or Below	11.6	34
<b>Household Income</b>			
	Under 25,000	9.1	26

	25,000-50,000	18.9	54
	50,000-75,000	22.1	63
	75,000 or More	45.9	134
	Choose not to Answer	2.7	8
<b>Parent Demographics Continued</b>			
		<b>%</b>	<b>N</b>
<b>Geographic Region</b>			
	South	30.1	88
	Northeast	35.1	103
	Midwest	21.6	63
	West	13	38
<b>Number of Children</b>			
	1	61	20.9
	2	111	38
	3	69	23.6
	4	32	11
	5	14	4.8
	More than 5	5	1.7
<b>Child Demographics</b>			
<b>Child Race/Ethnicity</b>			
	White	194	66.4
	Latino/Latina	31	10.6
	Black/African American	34	11.6
	Asian	12	4.1
	American Indian	3	1
	Native Hawaiian or Pacific Islander	2	0.7
	Other	16	5.5
<b>Child Gender</b>			
	Female	158	54.3
	Male	133	45.7
<b>Child Vaccination Status</b>			
<b>Completed Vaccine Series</b>			
	Yes	103	35.3
	No	189	64.7
<b>Initiated Vaccine Series (One or More Shots)</b>			
	Yes	145	49.7
	No	147	50.3
<b>Healthcare Provider Recommended Vaccine</b>			

Yes	147	50.3
No	126	43.2
Don't Know	19	6.5

Table 2 Descriptive Statistics and Cronbach's Alpha for Measures

Measure	# of items	M	SD	Possible range	Alpha
<b>TTM Variables</b>					
Pros	4	4.03	0.98	4-20	0.86
Cons	4	2.16	1.25	4-20	0.88
Self-efficacy	6	3.23	1.08	6-30	0.89
<b>CHIAS Variables</b>					
Perceived Harm	6	2.47	0.76	6-24	0.84
Barriers	5	1.79	0.88	5-20	0.92
Effectiveness	2	2.62	0.83	2-8	0.83
Uncertainty	3	2.57	0.7	3-12	0.45

Table 3 Race and Gender by TTM & CHIAS variables

<b>Parent Race</b>		White		Non-White		t	p
		M	SD	M	SD		
	Pros	46.64	10.17	50.82	9.61	-0.93	0.36
	Cons	49.61	10.3	50.91	9.26	-1.02	0.31
	Self-efficacy	50.51	10.33	48.82	9.11	1.33	0.18
	Perceived Harm	50.22	10.32	49.48	9.24	0.58	0.56
	Barriers	49.77	10.48	50.52	8.82	0.67	0.5
	Effectiveness	50.26	10.34	49.4	9.21	0.67	0.5
	Uncertainty	50.6	10.12	48.66	9.65	1.5	0.13
<b>Child Gender</b>		Female		Male		t	p
		M	SD	M	SD		
	Pros	49.2	10.44	50.87	9.4	-1.42	0.16
	Cons	47.85	8.83	52.48	10.73	-4.04	.000**
	Self-efficacy	49.11	10.06	51.07	9.89	-1.66	0.09
	Perceived Harm	48.85	9.58	51.24	10.31	-2.04	.04*
	Barriers	47.89	8.69	52.51	10.89	-4.01	.000**
	Effectiveness	48.66	10.48	51.73	9.04	-2.64	.009*
	Uncertainty	49.84	10.29	50.14	9.71	-0.25	0.8
<b>Parent Gender</b>		Female		Male		t	p
		M	SD	M	SD		
	Pros	50.35	10.29	49.26	9.37	0.86	0.38
	Cons	47.3	8.73	55.78	10.13	-7.35	.000**
	Self-efficacy	49.51	10.7	51.05	8.26	-1.23	0.22
	Perceived harm	48.32	9.98	53.59	9.08	-4.32	.000**
	Barriers	46.78	8.17	56.85	10.12	-9.06	.000**
	Effectiveness	49.3	10.17	51.49	9.51	-1.75	0.08
	Uncertainty	48.82	9.76	52.51	10.1	-2.98	.003*

Table 4 Parent Education, Geographic Region, and Household income by TTM & CHIAS variables

Parent Education	Four years or higher		Some college		HS diploma or below				F	p
	M	SD	M	SD	M	SD				
Pros	49.5	9.58	49.89	10.91	52.58	8.76			1.33	0.265
Cons	50.93	10.88	48.27	8.26	51.08	10.25			2.45	0.089
Self-efficacy	51.29	9.41	49.37	10.64	46.06	9.65			4.2	0.016
Perceived Harm	50.53	10.4	49.46	9.39	49.23	10.48			0.466	0.628
Barriers	50.4	10.67	49.25	8.69	50.45	10.68			0.448	0.64
Effectiveness	50.97	10.09	48.45	9.37	50.28	11.06			1.99	0.138
Uncertainty	50.77	9.69	48.61	9.93	50.72	11.38			1.54	0.216
Geographic Region	South		Northeast		Midwest		West			
	M	SD	M	SD	M	SD	M	SD		
Pros	50.3	9.17	50.57	10.57	49.87	9.53	48.46	11.18	0.377	0.77
Cons	51.52	10.17	47.86	9.9	50.09	9.37	52.14	10.13	2.88	.036*
Self-efficacy	50.03	9.37	51.18	11.07	48	9.57	50.02	8.82	1.32	0.267
Perceived Harm	50.18	8.98	49.48	10.72	50.15	10.81	50.75	9.06	0.175	0.913
Barriers	50.8	10.15	48.39	10.01	50.1	9.75	52.37	9.69	1.77	0.151
Effectiveness	48.85	9.81	51.37	10.29	49.08	10.31	50.46	8.88	1.24	0.294
Uncertainty	49.74	9.05	50.22	10.6	49.78	10.07	50.37	10.66	0.062	0.98
Household Income	Under \$25K		\$25-50K		\$50-75K		Over \$75K		Did not answer	
	M	SD	M	SD	M	SD	M	SD	M	SD
Pros	49.77	12.7	52.82	8.67	48.74	10.81	49	9.72	54.11	4.85
Cons	47.89	7.14	49.58	10.05	49.17	9.53	50.95	10.61	42.25	2.32
Self-efficacy	47.36	10.4	49.94	10.96	48.32	8.71	51.02	9.96	50.34	13.58
Perceived Harm	47.6	9.07	49.44	10.64	50.2	9.79	50.44	9.86	43.82	8.28
Barriers	49.11	7.63	50.09	9.66	48.2	8.79	50.84	10.87	47.1	9.83
Effectiveness	45.49	9.83	49.74	10.3	47.83	9.95	51.34	9.77	54.54	8.52
Uncertainty	44.04	9.19	50.09	10.05	50.29	9.75	50.78	9.74	43.45	8.74
									3.52	.008*

Table 5. Univariate Logistic Regression Results

		95% C.I.		
	Odds Ratio	Lower	Upper	Sig.
<b>HPV Variables</b>				
Health care recommendation	11.73	6.63	20.75	.000**
Talked about HPV				
vaccination	2.90	1.90	4.42	.000**
<b>Demographics</b>				
Race	1.24	0.75	2.05	0.40
Ethnicity	1.16	0.57	2.38	0.68
Child Gender	1.37	0.85	2.18	0.18
<b>CHIAS measures</b>				
Effectiveness	1.08	1.05	1.11	.000**
Perceived harm	0.96	0.94	0.98	.001**
Barriers	1.04	1.02	1.06	.003*
Uncertainty	0.97	0.95	1.00	0.08
<b>TTM measures</b>				
Pros	1.08	1.05	1.10	.000**
Cons	1.05	1.02	1.07	.000**
Self-efficacy	1.07	1.04	1.10	.000**

Table 6. Multivariate Logistic Regression Results

	Odds Ratio	95% C.I.		Sig.
		Lower	Upper	
<b>HPV Variables</b>				
Health care recommendation	18.84	8.96	39.63	.000**
<b>CHIAS measures</b>				
Effectiveness	1.04	0.99	1.09	0.06
Perceived harm	0.91	0.86	0.96	.000**
Barriers	1.08	1.03	1.15	.003*
<b>TTM measures</b>				
Pros	1.04	0.99	1.08	0.08
Cons	1.04	0.98	1.09	0.13
Self-efficacy	1.03	0.98	1.06	0.22



Figure 1 CFA Decisional Balance model

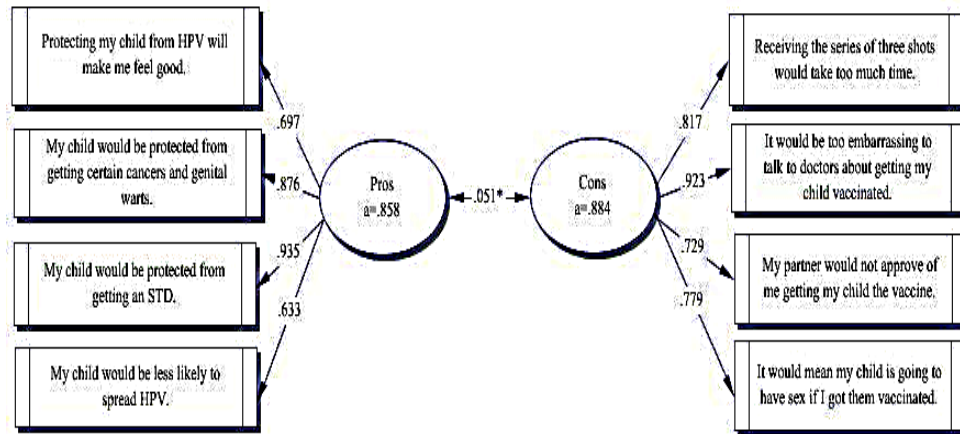
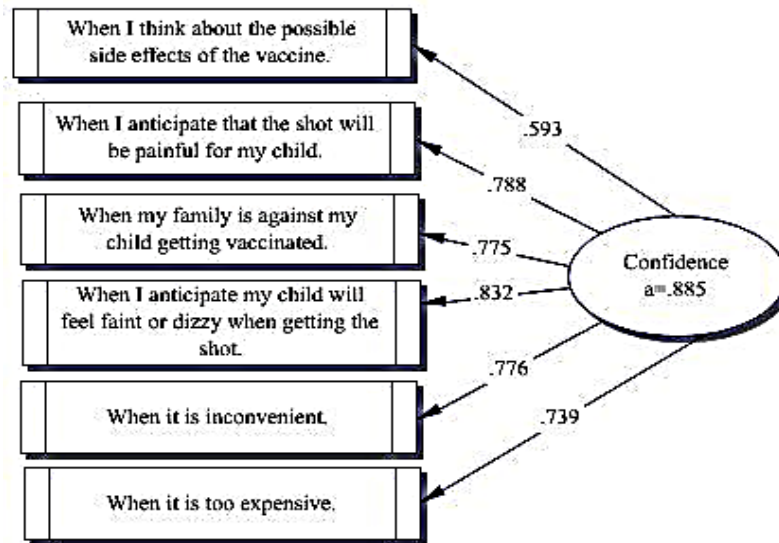


Figure 2 CFA Self-efficacy model



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